The dendrochronological age of ancient timbers of the Casa de la Moneda (Segovia, Spain) and its relationship with historic flood events

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Introduction and Regional Setting

In April-May 2009, during archaeological research work at the Segovia Mint (Casa de la Moneda; Segovia, Spain) for its rehabilitation as a museum, an old wooden floor appeared on the artificial channel bed derived from the Eresma River to move the old machinery coinage.

The wooden floor was located between the old bedrock channel, built originally in the late 16th Century by Juan de Herrera (ca. 1583-1590); and the Sabatini channel, a masonry structure that the architect Francisco Sabatini built in the late 18th Century (ca. 1771).

The main objective of this work was to date the wooden floor through dendrochronological techniques. We think that if we know the age distribution of the wood elements used for build the floor channel, we be able to estimate the dates of their use, and therefore relate them with the different repair works done over time (Murray et al., 2006). These repairs, which required replacement of woody elements, are related, in turn, with significant flood events recorded in the Eresma River, power source for hydraulic mechanism at the Casa de la Moneda. Thus, dating dendrochronologically could, indirectly, fit the potential flooding events by extreme rainfall.

We suppose (from documentary sources) that the wood needed for the built works of the artificial channel, as well as the needed wood used in repairs later, came from the closer Valsain forest, characterized by growing Valsain pine (Segovia City Council Agreement of August 20, 1583). The Valsain forest is located near to the city of Segovia and occupies the northern slopes of the Sierra de Guadarrama.

For several decades, Pinus sylvestris have been heavily sampled in order to build a reference chronology. Actually, we have reconstructed many individual sequences dated and synchronized growth, from 200 trees in 13 local chronologies. Some of these chronologies have been published in the International Tree-Ring Data Bank and others (Génova 2000 and Génova et al. 2009).

Materials and Methods

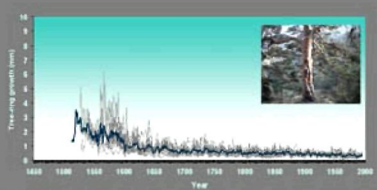
Acquired wooden elements during the archaeological works to this study were:

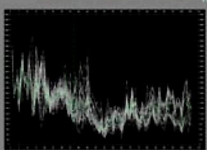
- 4 sleeper beams
- 3 fixations
- 3 boards

A total of 24 cross sections have been analyzed. In each sample a minimum of four radios were measured (with the equipment and application LINTAB Win TSAP), although in some cases it was necessary to measure up to seven radios.

Our working hypothesis is that each analyzed element came from different trees: the beams, due to its high scale and low technology timber processing at the hypothetical built age. Moreover, all samples presented pith, except one sample that had lost it by decaying.

From all dated and synchronized growth sequences obtained at the Sierra de Guadarrama, were selected those came from the older trees, in order to check if their early tree rings would coincide with that age of trees used to built the wooden floor. These series have been averaged half a chronology that has been used as master series.





Obtained growth sequences were synchronized among them and with the master series by mean of visual and statistic techniques using TSAPWin and COFECHA software.

Results and Discussion

Largest individual sequence corresponds with the best preserved beam (CM3: 163 tree rings) and the shortest individual sequences, with the worse preserved board (CM10: 82 tree-rings). Most of the individual average sequences (80%) have been synchronized and dated with high reliability.

Dated ring sequences seem to come, except in two cases, from peer's trees which began their growth around mid-sixteenth Century.

Since the longer sequences correspond in general with the best preserved, it appears that most of the trees used in the construction of the elements of the wooden floor were cut at the same age (perhaps in the mid-eighteenth Century). However, one of the beams (CM2) and a fixation (CM6) appear to be younger and come from trees between 25 and 50 years younger, which may have been felled for use in repairs needed after any of the flood events that affected the building.

This is the first time that the dating of historic timber has been used for dendrogeomorphological analysis and thus we hope to open a new research area.

References

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